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place only when the liquid was brought to a lower. The crystallisation now takes place within the boiler itself, and, for the purpose of giving the mass greater consistency, it is raised in these "heaters" to a temperature of about 180°, while it was boiled at 130° or 135°. The sugar is kept continually stirred, to drive off, in the form of vapour, the superfluous water with which it is combined, and to give the future loaf a finer and firmer texture; this stirring is called, in the language of the workmen, "hauling" and "mixing." This, though a busy scene, is one which is easily comprehended. It is a fitter one, however, for the pencil to delineate than the pen to describe.

The liquor is now ready for the moulds in the filling room. Here an entirely new scene meets our view. Nearly the whole floor of a very large, square, stone-paved room is covered with conical iron moulds, about two feet in length and six inches in diameter at their large ends; the greater portion of which are standing close together, each one on its apex and supported by its neighbour, with here and there, in front, a mould standing on its base gives the necessary support to the whole. Before we have taken in the scene, we have to stand aside to let a labourer pass, who bears before him a large copper basin filled to the brim with the hot saccharine liquor. Others succeed him, some stripped to the waist, some clothed in trousers and a sort of flannel or loose Guernsey shirt. We watch their proceedings. From the copper coal-scoop-looking machine they fill the various moulds ranged in hundreds along the floor, without spilling a single drop. It being important to fill all the moulds at about the same temperature, it is arranged that a sufficient number of men shall be employed to "fil out" the contents of one sugar boiling in about half-an-hour. While some of the workmen are thus engaged at a sort of half run in passing from the heaters to the moulds and filling out, others are occupied with little iron instruments, shaped something like solid triangles set horizontally on handles, in stirring and scraping round the edges of the moulds to prevent any adhesion, and to diffuse the small crystals still forming equally through the liquid mass of sugar. A most surprising thing it is to see how the workmen contrive to carry the scoops of hot "liquor" from the heater, and fill up the moulds, without ever scalding themselves or spilling the contents. But experience in this, as in all other mechanical operations, is the great teacher.

The sugar loaves still contain a certain portion of molasses; though, by the various processes they have undergone, they have been deprived of their solid impurities, a portion of their water, and the greater part of their colouring matter. To get rid of this remnant is the object of the next process; so, after standing in the filling-room for about a couple of days, the moulds are carried upwards, from floor to floor, through a series of trap-doors.

Let us now see how this molasses or syrup is finally made to quit the refined sugar. The moulds, which give to the refined mass the well-known sugar-loaf shape, are of various sizes, but the mode of manipulation is the same with each. In the language of the refinery, *loaves* are the best, and *lumps* the commoner description of sugar. The smallest moulds contain as little as ten pounds, and the largest not less than two hundred and fifty. We will suppose that a sufficient degree of solidification has taken place; the next

process, then, is the washing, or netting, which takes place in an upper room with a large floor, covered all over with moulds, placed each one of them in an earthen jar. Here the washing takes place. The small opening at the apex of each conical mould is uncovered, and the loaf allowed to drain. But the draining does not entirely remove the syrup from the sugar, a small portion still remaining among the crystals and the coating of the loaf. To get rid entirely of that part of the syrup which is still left in the sugar, the loaves are washed in rather a peculiar way. Till latterly, the washing was performed by means of a stratum of fine white clay and water, which, being placed on the surface of the base of the loaf, was allowed to percolate through it, and carry the colouring matter with it. At present, however, the porous surface, or sponge, is made of sugar itself, instead of clay. The rough portion of the sugar being scraped off the base of other loaves, it is mixed with water, and applied in the way the clay used to be. This "magna" or mortar percolates through the sugar, and escapes through the hole in the apex of the mould, in the shape of a fine transparent syrup of a light brown colour. When this "magna" becomes dry, a solution of fine clear sugar is poured; and thus this process is repeated till the loaf has lost all trace of molasses and colouring matter, and rivals snow itself in whiteness and points of sparkling light. From room to room is this process repeated, according to the different qualities of sugar required. The syrup, in which there still remains a certain portion of crystallisable matter, is treated in the same way as raw sugar, till at last nothing remains but the liquid so well known to most of us, when children, as treacle, vast quantities of which are used by the cheap confectioners and the makers of what is called sweet-stuff.

Nothing now remains, therefore, but to prepare the loaves for sale, which last process is known in the factory as "brushing off," a term certainly not very applicable, seeing that no brush is used at all. When the "washing" or "netting"—making the sugar net, neat, or pure—is completed, the face of the loaf is made smooth by means of a scraper or sharp knife. After having remained some days in the mould, the loaf is finally released by a smart blow against a post standing up on the floor. But in spite of the most careful "washing," the point of the sugar loaf still remains in a somewhat soft and discoloured condition, to remove which it is carried to a machine, in which a couple of cutting knives revolve by the aid of a wheel, turned either by hand or steam. The apex of the loaf being introduced to these, is speedily shaved or trimmed into the form usually seen, an operation known in the factory as "turning off."

In the inferior kinds of refined sugar, the softened end is simply chipped off, which leaves the loaf in the shape of a truncated cone. The piece chipped off is either used as "magna," or is sold by the grocers under the name of "crushed crystallised West Indian sugar;" it has a light brown colour, and is scarcely inferior to the remainder of the loaf, except that it contains a small portion of molasses.

We had almost forgotten to say, that before the sugar is finally ready for sale it is papered up, and thoroughly dried in a stoving room, which is heated to a very high temperature by means of a series of iron pipes, through which the waste steam from the boiler is made to pass.

## SPANISH MULETEERS.

For many years, one great obstacle to progress in Spain has been the non-existence of roads, rendering mules and muleteers indispensable. So severely is this defect, the consequence of bad government and internal dissensions, felt, that in certain districts wine, and good wine, is consumed on the spot at one-halfpenny per quart, for want of the means of conveyance. Mules can only carry small loads, especially when these loads are to be conveyed along the break-neck gullies so common in

Spain. Muleteers, then, still exist; and perhaps they are the only Spaniards who still carry the guitar on their backs. The sentimental age of serenaders has passed away everywhere, except upon the stage and in the novels of certain modern publishers, who like revivals of the antique. Figaro and Almaviva are mere fanciful portraits, which no more existed than Fra Diavolo or the Charles II. of Sir Walter Scott. The muleteer alone, who often follows the most diffi-

cult and solitary roads, who often wants amusement, has kept the habit of thrumming away at his old guitar. Half lying down upon his mule, as M. Giraud shows us in his sketch of the *Sierre Nevada*, whether climbing a hill or descending a slope, he sings his couplets as he moves—those *cantarillos*, which he generally improvises and addresses to his absent fair, or even to his mules.

The accompanying picture by M. Giraud represents a well-

high mountains it is so; the animal guides the man. The mules are so accustomed to these perilous roads, that they know far better how to place their feet than do their conductors. Besides, the mule is obstinate and self-willed. If you use the spur, it stops; if you stroke it, it lies down; if you pull the reins, it gallops off: it is better to leave it alone.

The saddle is generally composed of two or three variegated



A SKETCH OF THE SIERRE NEVEDA.—FROM A PAINTING BY M. EUGENE GIRAUD.

known scene in the *Sierre Nevada*. A *mozo de mulas*, a kind of muleteer, leads the little caravan, or guides it by his songs. The slope is so rapid, and the path so narrow—we cannot dignify it by the name of a road—that we are surprised and tremble almost to see what liberty the animals are allowed. The bridles hang on their necks; and yet the abyss is there—an abyss of some hundred yards in depth, into which the slightest false step would drive them. But in the land of

blankets doubled up, and sometimes of a well-stuffed cushion to disguise the sharp back of the brute. On each side, instead of stirrups, are pieces of wood to rest your feet on. The head of the animal is almost concealed by ornaments. The guide goes before on a mule, or accompanies that animal on foot, his guitar in his hands, his gun on his shoulder, and his powder-horn close at hand. Such a journey is exceedingly amusing.